

REMARKS

Claims 9 and 27 have been amended. No claims have been canceled or added. As such, claims 1, 4-14, and 21-28 are currently pending in the case. Further examination and reconsideration of the presently claimed application are respectfully requested.

Allowed Claims

Applicant acknowledges and appreciates the Examiner's allowance of claims 1 and 4-8.

Section 103 Rejection

Claims 9-14 and 21-28 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent Application No. 2001/0040778 to Abraham et al. (hereinafter referred to as "Abraham") in view of Japanese Patent JP363004621A to Ozaki et al (hereinafter referred to as "Ozaki"). To establish a *prima facie* obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974), MPEP 2143.03. Obviousness cannot be established by combining or modifying the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion or incentive to do so. *In re Bond*, 910 F. 2d 81, 834, 15 USPQ2d 1566, 1568 (Fed. Cir. 1990). Abraham and Ozaki do not teach or suggest all limitations of the currently pending claims, some distinctive limitations of which are set forth in more detail below.

Abraham and Ozaki do not teach or suggest alternating steps of etching exposed portions of a magnetic layer and implanting dopants into the exposed portions. Amended claim 9 recites:

A method for forming a magnetic memory cell junction, comprising: patterning a mask layer above a stack of layers comprising a magnetic layer; and alternately etching and implanting dopants into exposed portions of the stack of layers, wherein the step of alternately etching and implanting dopants comprises alternately etching and implanting dopants into exposed portions of the magnetic layer.

Support for the amendments to claim 9 may be found, for example, in Figs. 7a-10b and accompanying text of the specification. To support the rejection of claim 9, the Examiner cites Figs. 10-13 of Abraham. As noted in responses to a previous Office Actions mailed July 19, 2005 and February 2, 2006, none of Figs. 10-13 or the accompanying text of Abraham teach or suggest alternating steps of etching exposed portions of a stack of layers and implanting dopants into the exposed portions. Clear distinctions between the limitations recited in claim 9 and the teachings of Abraham were outlined in the responses to the Office Action mailed July 19, 2005 and February 2, 2006 and are reiterated below.

In particular, the methods described in reference to Figs. 10a-10e and 11a-11e of Abraham outline processes in which a stack of layers is patterned in alignment with a masking layer and an insulating layer is deposited thereafter. There is no teaching or suggestion of dopant implantation within such methods, much less incorporating a dopant implantation process alternately with etching the stack of layers. Consequently, Abraham fails to teach or suggest the limitations of claim 9 in reference to Figs. 10a-10e and 11a-11e. Similarly, the process described in reference to Figs. 12a-12c fails to teach or suggest dopant implantation. Rather, Figs. 12a-12c depict a process in which a single layer (i.e., mask 200) is removed and another layer (i.e., free region 424) is deposited in its place. Not only does Abraham fail to teach or suggest dopant implantation within such a process, there is no teaching or suggestion of etching a stack of layers within the method described in reference to Figs. 12a-12c. Consequently, there is no teaching or suggestion of alternating such processes steps in reference to Figs. 12a-12c. Although the method described in reference to Figs. 13a-13c in Abraham includes the implantation of oxygen, there is no teaching or suggestion of etching a stack of layers within such a process, much less alternately with the implantation process. Consequently, the method described in reference to Figs. 13a-13e fails to teach or suggest the limitations of claim 9.

Although Ozaki teaches implanting high energy ions into a patterned semiconductor topography, etching portions of the topography damaged by the ion implantation, and repeating such a succession of steps to form a via hole within a GaAs substrate, there is no teaching or suggestion within Ozaki of using such a succession of steps through a magnetic layer. Consequently, Ozaki does not teach or suggest the limitations of claim 9. Furthermore, there is no motivation within

Ozaki to use such a technique for the formation of a magnetic memory cell junction. In particular, not only does Ozaki fail to teach or suggest applying the ion implantation and etch sequence taught therein to a magnetic layer, there is no teaching or suggestion within Ozaki that such a process would be effective for forming a via hole within a magnetic layer. Rather, Ozaki merely teaches that the process is effective for forming a via hole in GaAs substrate masked by a metal layer.

Abraham and Ozaki do not teach or suggest generating veils along sidewalls of a patterned stack of layers during an etching process, much less implanting dopants into the veils. Claim 23 recites:

A method for forming a magnetic memory cell junction, comprising: patterning a mask layer above a stack of layers; etching exposed portions of the stack of layers in alignment with the mask layer, wherein the step of etching comprises generating veils along sidewalls of the patterned stack of layers; implanting dopants into the veils; and reiterating the steps of etching and implanting.

Dependent claim 10 includes similar limitations for base claim 9. Neither Abraham nor Ozaki mention the formation of veils along sidewalls of the stack layers during the patterning processes described therein. Consequently, neither Abraham nor Ozaki or any combination thereof can teach the limitations of claims 10 and 23. The Examiner states in the Office Action that "... it would have been obvious to one of ordinary skill in the art to use the step of alternately etching and implanting dopants in Abraham's device in order to generate veils along the sidewalls of the patterned stack layers." Such a statement is traversed. As noted above in regard to the patentability of claim 9, Abraham does not teach or suggest alternating steps of etching exposed portions of a stack of layers and implanting dopants into the exposed portions. Consequently, the aforementioned statement made in the Office Action does not have merit. Furthermore, even if, for the sake of argument, Abraham did teach alternating steps of etching and implanting, there is no teaching or suggestion with Abraham that the etching process described therein includes the formation of veils along sidewalls of a patterned stack of layers and, therefore, the Examiner's conjecture that it would be obvious to one skilled in the art that veils would be formed by the etch process described in Abraham is unsound.

For at least the reasons stated above, Abraham and Ozaki fail to teach or suggest the limitations of independent claims 9 and 23. Therefore, Applicants believe claims 9 and 23 are patentably distinct over the cited art. In addition, dependent claims 10-14, 21, 22, and 24-28 are patentably distinct over the cited art for at least the same reasons as their respective base claim. Accordingly, removal of this rejection is respectfully requested.

In addition to being patentably distinct for reasons noted above, several of the dependent claims are believed to be separately patentable as set forth below.

In particular, dependent claims 11 and 24 specify veils generated during the processes respectively recited in claims 10 and 23 are also subsequently removed. As noted above, neither Abraham nor Ozaki teach or suggest the formation of veils during the processes described therein and, therefore, neither of such references teaches the removal of veils during the processes described therein.

Dependent claims 12 and 25 specify the etching steps recited in respective based claims 9 and 23 include etching a greater amount of the stack of layers than an amount of the stack of layers implanted with dopants during a step of implanting. As noted above, Abraham fails to teach both etching and implanting dopants in a process sequence for fabricating a magnetic memory cell junction and, as such, Abraham cannot teach comparative degrees of such processes for a fabrication sequence. Although Ozaki teaches alternating etching and implanting steps for the formation of a via within a GaAs substrate, Ozaki fails to teach that a greater amount of the GaAs substrate is etched than an amount implanted with dopants. Rather, Ozaki teaches in Figs. (b) and (c) that the amount of the GaAs substrate implanted with ions is the same amount that is subsequently etched. "... high energy ions of a relatively large mass number are selectively implanted into required part of the GaAs substrate 1 surface through the aperture of the mask pattern 3 so as to form a damaged layer 1a. Then only the damaged layer 1a is selectively etched with acid." (Ozaki, Constitution).

In regard to dependent claims 14 and 26, the implanting processes recited in base claims 9 and 23 are specified to including oxidizing and nitriding exposed portions of the stack of layers. Neither Abraham nor Ozaki teach or suggest introducing nitrogen into the semiconductor topographies described therein and, as such, neither Abraham nor Ozaki can teach the limitations of claims 14 and 26.

Dependent claim 21 specifies the step of alternately etching and implanting recited in claim 9 is initiated with etching exposed portions of the stack of layers. As noted above, Abraham fails to teach both etching and implanting dopants in a process sequence for fabricating a magnetic memory cell junction and, as such, Abraham cannot teach the initiation of one step versus another. Ozaki specifically teaches first implanting high energy ions to damage a GaAs layer and subsequently etching only the damaged portions of the layer. Consequently, neither Abraham nor Ozaki or any combination thereof can teach the limitations of dependent claim 21.

With regard to dependent claims 27 and 28, materials are specified which are subject to the alteration of etching and implanting steps in base claims 9 and 23. In particular, claim 27 specifies the alternately etching and implanting steps recited in base claim 9 are further performed into a tunnel barrier layer of the stack of layers. In addition, claim 28 specifies the reiteration of etching and implanting steps recited in claim 23 include repeating the steps through a first set of one or more magnetic layers, a tunnel barrier layer, and a second set of one or more magnetic layers. As noted above, Abraham fails to teach both etching and implanting dopants in a process sequence for fabricating a magnetic memory cell junction and, as such, Abraham cannot teach the materials which such an alteration of such steps may be employed. Furthermore, as noted above, Ozaki fails to mention applying the alteration of etching and implanting steps taught therein for any material other than GaAs and, as such, there is no motivation within Ozaki to apply to the materials specified in claims 27 and 28. Hence, neither Abraham nor Ozaki or any combination thereof can teach the limitations of dependent claims 27 and 28.

CONCLUSION

This response constitutes a complete response to all of the issues raised in the Office Action mailed June 23, 2006. The prior art made of record and not relied upon is not considered pertinent to the presently claimed case. In view of the remarks herein, Applicants assert that pending claims 1, 4-14, and 21-28 are in condition for allowance. If the Examiner has any questions, comments, or suggestions, the undersigned earnestly requests a telephone conference.

No fees are required for filing this amendment; however, the Commissioner is authorized to charge any additional fees, which may be required, or credit any overpayment, to Daffer McDaniel LLP Deposit Account No. 50-3268.

Respectfully submitted,
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